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BREEAM credits – operational value to the occupier

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Abstract

In the twenty one years since its inception BREEAM has become the leading environmental benchmark in the UK. There are now a considerable number of buildings with BREEAM credentials, the researchers have carried out a short study to determine whether the credits achieved, (or not achieved) have had an effect on the occupiers of a sample of buildings. The research focuses on the health and wellbeing of staff and notes that gaining a BREEAM credit does not necessarily mean that the working environment is acceptable in relation to that measure. The investigation also examines maintenance issues as regards innovative features of the building. It concludes that there is a considerable variation in the benefits of BREEAM credits to building occupiers.

Keywords BREEAM credits, occupier perceptions. innovative technology

1.0 Introduction

The BRE website currently displays a small logo advertising 21 years of BREEAM. Perhaps coincidentally there has been a number of research papers published recently on two major themes. First, attempting to prove that BREEAM certification adds financial value to developments, for example Chegut, Eichholtz and Kok (2011) and a series of papers by Patrick McAllister at Reading (Fuerst et al 2011). The other strand being the examination of BREEAM as a contributor to health and well being, and hence productivity in the office environment, for example Smith & Pitt (2011). As a further branch of research into BREEAM, this work is an audit of BREEAM in action, in particular looking at the performance of buildings in the years after completion to evaluate the extent to which the credits awarded have achieved their intention or have been subverted, or unacknowledged by occupiers.

This paper reports a study of research into the effectiveness of BREEAM credits. The researchers are BREEAM assessors who have returned to completed projects, offices and Bespoke BREEAM buildings, to determine the extent to which the credits achieved have proven to be effective for the occupiers of the building. Where credits have not been achieved it has been interesting to ask the occupiers to speculate as to the extent to which the omission of this credit has affected the occupants.

To date, in depth interviews with the office managers of five buildings have been carried out. Four of the five interviewees were non-technical administrators, or perhaps more accurately self taught facilities managers in predominantly office type buildings. One of the interviewees is a developer/landlord who manages his development with a high level of expertise and involvement. The non-technical administrators were unaware of the existence of BREEAM certification but enthusiastically participated in the research to discover information about their building and the BREEAM scoring system.

2.0 Findings

The findings of the research are presented as a table to summarise the results and commentary on the qualitative observations of the correspondents. Credits which had no bearing on the occupants experience of the building, for example site management by the contractors, or treatment of contaminated land have not been addressed in the research.

The correspondents were asked their opinion/experience of the credit irrespective of whether the credit was awarded. The buildings studied are represented by letters from A-E. Where the credit was awarded, the opinion of the respondent will be represented in bold type where the credit was not awarded it will be in normal type. Over time and the range of buildings examined, BREEAM credits have evolved, the authors have used their experience to morph credits together to maintain consistency as far as possible. In addition, not all credits applied to all buildings, for example in the management section two of the Bespoke BREEAM assessments included the community consultation credit.

It is assumed that the reader has some knowledge of BREEAM, a short title has been included in the tables to represent the variation of titles and numbering over time. The table below shows the typical weighting of the various components of the BREEAM assessment, as may be noted not all credits are equal, this makes design teams consider carefully which are worth striving for when balanced against the time needed to collate the evidence.

BREEAM 2006 Office credit weighting

	Number of credits	% weighting
Management	9	15
Health & Wellbeing	13	15
Energy	18	
Transport	15	
Energy & Transport	33	25
Water	6	5
Materials & Waste	12	10
Land use & ecology	10	15
Pollution	15	15

2.1 Management credits

	no value	Little value	neutral	some value	valuable
Commissioning			E	AB	CD
Seasonal			E	AB	CD

commissioning					
Building user guide	E				ABCD
Consultation			CE		

All the buildings had been subject to commissioning and in some instances seasonal commissioning, there was not a strong awareness of the process amongst the correspondents other than developer/landlord who had also procured a post occupation evaluation. When explained to them the effective commissioning of the building was generally valued by the occupants although in one instance it had not been entirely successful, this will be discussed further in the health and wellbeing section.

The building user guide was valued by two of the respondents, one used it as an effective tool to introduce new tenants to the operation of the building, another had found it particularly helpful as a contacts list for consultants and suppliers. In two instances the simple building users guide credit had not been awarded, but the occupants would have found it very helpful when described to them. The fifth respondent (building E) reported that a simple building user guide was in existence but it had been given to the outsourced FM contractor, consequently there was no value to the occupier.

As regards consultation with the community and local business interests, neither building had provided evidence of consultation to gain the credit. In the event the correspondents did not report any issue which may have emerged or be solved by the design stage consultation process.

2.2 Health and Wellbeing

Within BREEAM, 'Health and wellbeing' is a category in the assessment. The credits are listed below with the respondent's views.

	no value	Little value	neutral	some value	valuable
Avoidance of legionella					ABCDE
Natural ventilation / openable windows		A			BCDE
Internal air pollution	B		DE	A	C
Ventilation rates			D		ABCE
Daylighting		A	B	E	CD
View out		A			BCDE
Glare control					ABCDE
Lighting design				B	ACDE
HF lighting				B	ACDE
Lighting zones			C	B	ABDE

Thermal zoning		E		A	BCD
Thermal comfort modelling	A				BCDE
Internal noise levels			CD		ABE

There follows a selective commentary on the more interesting aspects of the study

2.2.1 Legionella

The avoidance of legionella is fundamental to the health and wellbeing to the occupants of the building. All the projects achieved the credit, it would be difficult for the design team to state that the project did not comply with best practice as regards the avoidance of this potentially fatal ailment. However, in practice, during the assessment of these and other projects the authors have found it difficult to persuade design teams to provide the necessary evidence and thus formalise where responsibility for the legionella issue evidence lies in the design team. This may be due to the nature of the design process where in many cases much of the detailed design issues and installation are devolved to the M&E contractor and consultants are not entirely confident that they alone have the evidence that every detail of the codes have been strictly adhered to in the construction process.

2.2.2 Openable windows and natural ventilation & air pollution

Natural ventilation and openable windows are valued by occupants however the feature is not without problems, noise pollution from a nearby road in one instance making the natural ventilation unusable. In a number of instances the air pollution credit had not been awarded due to the proximity of car parking areas, the loss of this credit was disputed by the occupants as the risk of air pollution was very slight. This highlights a feature of this credit that is often considered inequitable by design teams, BREEAM equates a car parking bay with a busy main road as regards atmospheric pollution.

2.2.3 Daylighting and view out

It is noticeable that none of the subject properties achieved the day lighting credit although there were no complaints about natural lighting levels; four of the buildings achieved the view out credit. From inspection it is likely that some of the buildings could have achieved the day lighting credit but the credit compliance requires extensive calculations and 100% compliance of the occupied and designated rooms in the bespoke BREEAM.

The deep floorplate building studied did not generate complaints from occupants about the lack of a view out or day lighting.

2.2.4 Glare control

This credit attracted lots of comment, in one instance the credit had been awarded at design and procurement stage but not all the blinds had been fitted. Invariably those buildings which did not achieve the glare credit had retrospectively fitted occupant

controlled blinds to cope with user complaints. In one of the building there is a second round of blind installation underway to cope with a series of unforeseen problems in certain light conditions.

2.2.5 Thermal comfort modelling

This credit also attracted a lively debate, three building which had not been subject to thermal comfort modelling (TCM) identified problems in the use of the building which they hoped would have been solved by TCM. Of the two buildings which had been subject to TCM, one was very successful with few complaints, the other by contrast had significant and ongoing issues regarding thermal comfort, normally attracting five complaints per day from staff. One of the features of the research has been the identification of design faults which were not anticipated at the design stage and are proving to be insurmountable problems for the occupants. In some instances they were relatively minor, glare through a rooflight for three weeks in the height of summer. In others there were fundamental design faults which had required extensive retrofitting of remedial measures (unsuccessful) or curtailed the effective use of the building.

2.2.6 Internal noise levels

Of the five buildings, two had achieved the noise credits although one had subsequently had to retrofit additional baffles to reduce the ambient noise. Of the other three buildings, one was neutral on noise, no problems reported by staff. The other two had significant noise issues relating to noise penetration around the building, for example cafe noise spreading through an atrium; however this is outside the scope of the credit.

2.3 Energy

	no value	Little value	neutral	some value	valuable
Sub metering	CD	E	A		B

All of the subject buildings gained the sub metering credits, perhaps an indication that, in terms of pounds per point, this credit is quite cheap and easy to achieve. The credit requires the metering of significant energy uses and tenancy sub metering. One of the interviewees had some extensive sub metering but with the benefit of hindsight would have preferred more sub metering to help monitor energy use more effectively. By way of contrast three of the buildings which had achieved the credit did not use them effectively. One building, with 27 meters in a relatively small building, did not use them but charged out electricity in the service charge on a pro-rata floor space basis. In another example, a multi-let office building, which incorporated a public cafe, employed a similar service charge arrangement which was a considerable bargain for the cafe.

2.4 Transport

	no value	Little value	neutral	some value	valuable
Transport CO ₂ /Maximum car parking facilities	CDE		A		
Public transport			B		ACDE
Cyclist facilities		D	E		ABC
Travel plan					E
Proximity of key amenities					CE

There has been considerable evolution in the transport section of BREEAM, the analysis above has been interpreted to adapt the credits gained to give an approximation of the aims of the credit.

Generally these credits are location dependent and are not in the gift of the design team as the location may or may not have good public transport links. Similarly credits are awarded if the development has no parking facilities but it may be adjacent to a public car park so the development gains credits but there are parking facilities available which may facilitate encourage commuting by car.

2.4.1 Parking facilities

BREEAM awards credits to developments with limited car parking facilities, in three instances the developments had been built on restricted sites with very limited parking. Although the credits were gained, there was limited on street parking available but the absence of parking facilities had been a severe limitation on operational matters.

2.4.2 Cyclist facilities

Three of the developments gained the credits awarded for cyclists facilities, they were popular where provided and in one instance additional cycle parking (not BREEAM compliant) had been installed since completion. In the largest development it was reported that only 2% of staff came to work by bike. This may be a reflection on the topography of the locality and the poor provision of safe cyclist routes in the region.

2.4.3 Travel information space

This credit has the accolade for best value 'pounds per point', a simple, and cheap easy to achieve credit which all developments achieve. There is clearly an issue as to the extent to which the notice board in question may be maintained for the intended purpose

2.5 Water

	no value	Little value	neutral	some	valuable
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				value	
Water consumption					ABCDE
Water meter	DE	C	A		B
Water leak detection	DE	C	A		B
Sanitary supply shut off	DE		AC		B
Use of rain/grey water	C				

These credits are readily available and generally not expensive to achieve. The use of low flow taps/showers and dual flush WCs had not caused any complaints or problems in use. There was little interest in water metering or water conservation amongst the correspondents questioned, this may be due to the ample water supplies in the region due to a significant reservoir investment made in the previous century and the lack of any clear understanding of any economic benefit to the building owner.

There was an unfortunate outcome from one installation of rainwater recycling, (which incidentally wasn't large enough to gain the BREEAM credit). A failure of the rainwater sump pump caused a basement flood which caused thousands of pounds worth of damage, the rainwater recycling has not been reinstated as part of the repairs.

2.6 Materials and waste

The material specification does not directly impinge on the occupant experience; the coverage of this section of BREEAM is therefore limited

	no value	Little value	neutral	some value	valuable
Recyclable waste storage	CD				ABE
Durability /impact protection		C			E

The credit for provision for recyclable waste was gained by all developments, three of the users found it very valuable, of the other two, one did not actually sort waste because the Local authority had a waste sorting facility. In the other instance the recycling space had been turn into a (small) office.

Two of the developments achieve the durability credit; it was greatly valued by one of the correspondents but not actually recognised by the other.

2.7 Land use and ecology

The land use elements of the credits have been ignored in this section as they have little impact on the occupants, however it is thought appropriate to examine the ecology aspects of the development.

During the interviews there was a low awareness of ecology, occupants recognised that it would be useful to have a green open space as an amenity, one office manager noted that a flat roof section could have usefully made habitable with a roof garden. In one development there had been enormous efforts made to enhance ecology, to the extent of turning the car part into a miniature orchard and installing a pond in the grounds. In this instance the ecological enhancement is appreciated by the building occupants.

2.8 Low carbon technology

Of the five schemes studied two made use of low carbon technology, with mixed results.

In one building the planning authority required that 10% of the energy demand should be from renewable sources. At the design stage it was intended to employ a ground source heat pump however as the design moved into the procurement stage it became apparent that the original idea, to incorporate the ground loops into the structural piling would prove problematical. It became apparent that there was a lack of expertise in the piling/ground loop technology and the design team decided to adopt a more conventional approach. In the final design the building is served by condensing gas boilers and evaporative cooling which avoids the use of refrigerants. The technologies have worked effectively but there are problems with the air distribution which were not rectified during the seasonal commissioning and will require further remedial work to produce an acceptable internal environment.

The other low carbon technology employed is biomass heating. This has proven to be successful in the long term. The boiler installation, fuel storage, delivery and transfer works effectively. The technology has proven to be economical in the long term. However there were significant teething troubles to be overcome, the original boilers had to be replaced as the originals did not perform to specification. The original boilers were expected to be able to cope with a wide variety of waste timber, in the practice the new boilers use a refined pelleted fuel and have proven to be trouble free.

3.0 Discussion

The research has proven to be an interesting exercise which shows that in the main, the measures installed to achieve BREEAM certification have been beneficial for the building occupants.

There are however a number of issues which have emerged from the research about the nature of the BREEAM process

3.1 Daylighting

None of the projects were awarded the daylight credits despite the fact that many of developments appeared to be, in the opinion of the authors, provide a light and airy working environment. It is thought that this is due to the onerous nature of the credit compliance, and the need for calculations in addition to the normal M&E design contract to prove that all the working environments achieve the required standard. Daylight calculations were found to be not within the design team's normal scope of work and clients have been reluctant to commission them to achieve the credit.

3.2 Sub metering of energy

These credits are relatively easy and cheap to gain, however the non-technical managers of the buildings were not using them effectively to monitor energy use or even ensure a fair distribution of charges for energy. This suggests that the energy use is not being monitored and targeted at this level of detail in the buildings studied.

3.3 Noise penetration

The BREEAM credits on noise are mainly concerned with ambient noise levels. In one building in which the credit had been awarded subsequent fitting of baffles indicated that the credit had not been effective. It was noticeable during the interviews that all building had noise cross transfer issues rather than ambient noise, some of which were a major concern in the operation of the building. It may be helpful for BRE to consider how the health and wellbeing credits could be enhanced to pick up noise penetration issues in the projects.

3.4 Thermal comfort modelling

Most of the buildings visiting had problems with thermal comfort, some of the buildings in question had been subject to thermal comfort modelling but the modelling had not identified the problems found in practice. It may be advisable for BRE to include thermal comfort modelling as a minimum standard to encourage a more sophisticated approach to design. The extent of the thermal comfort modelling (for example to measure the rather simplistic number of hours over a defined summer temperature) may require redefining. This has a parallel with the daylighting issue, measures which use to be examples of good practice to be rewarded by BREEAM are increasingly becoming the norm as design teams have to work from the earliest design stages to achieve an environmentally acceptable building to meet stringent building regulations and more sophisticated occupier expectations.

3.5 Glare control

Although it is a relatively minor item, the specification of solar blinds is, in the experience of the authors, often omitted (or deleted) as a money saving exercise during the design stage. All of the buildings studied where either owner occupied or to be used as serviced offices. The provision of solar blinds was highly valued by occupiers and had invariably been an expensive addition during the first year of occupation.

4.0 Conclusions

This investigation has indicated that occupants are generally satisfied and value the

design features of BREEAM credits. Credits relating to health and wellbeing of occupants generated the most comment; this is not surprising as it closely impinges on the effectiveness of the buildings as a work space.

It is noticeable that the day to day running of these buildings is often in the hands of non-technical managers, they are interested in the buildings and quality of environment provided for their occupants but lack the technical expertise to make the most of the features of the building. They also report a paucity of technical support in their organisations. The 'simple building user guide' has a real role in these instances and has the potential, if well written, to be a vehicle for continuous environmental enhancement, particularly in the use of energy and water metering.

Most of the respondents reported ongoing issues around thermal comfort; it may be that these problems originate in the split of design responsibility for thermal comfort between the architectural and building services professions. Anecdotal evidence suggests that the revisions to Part L of the building regulations have required greater integration of architecture and engineering at the early design stage. It would be a considerable advantage if this cooperation leads to a more sophisticated approach to thermal comfort modelling.

Finally, noise penetration, an area which affects the usability of building and the health and wellbeing of occupants. This is not covered in BREEAM for offices however BREEAM for Education (BRE 2011) has a credit which deals with noise insulation between spaces, it refers to Building Bulletin 93 and BS8233. It would be advisable to make this credit available to office buildings in the hope that the problems found in this research may be avoided in future

In its twenty first year BREEAM has developed from an unknown environmental assessment tool for the cognoscenti only, to a mainstream accreditation which has significantly improved site practice, material specification and building design for the benefit of occupants and society. BREEAM has become the benchmark for researchers looking for value or productivity gains in 'green' buildings. This research indicates that the measures included to achieve BREEAM certification are beneficial for building occupants but it does not produce perfect buildings.

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